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INT CL^6 **H04B 7/26 , H04J 3/12 , H04Q 7/30**
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(54) Allocation of signalling and traffic slots in TDM communication system

(57) A Time division Multiplexed communications system has a frame divided into traffic and signalling information. The slot allocated to a communications unit in the signalling frame is independent from the respective slot allocated in the traffic frame. The system is also capable of switching between trunked slow associated control channel (TSACCH) and normal slow associated control channel (SACCH) depending upon whether the amount of signalling messages to be sent exceeds the capacity of a particular slot.

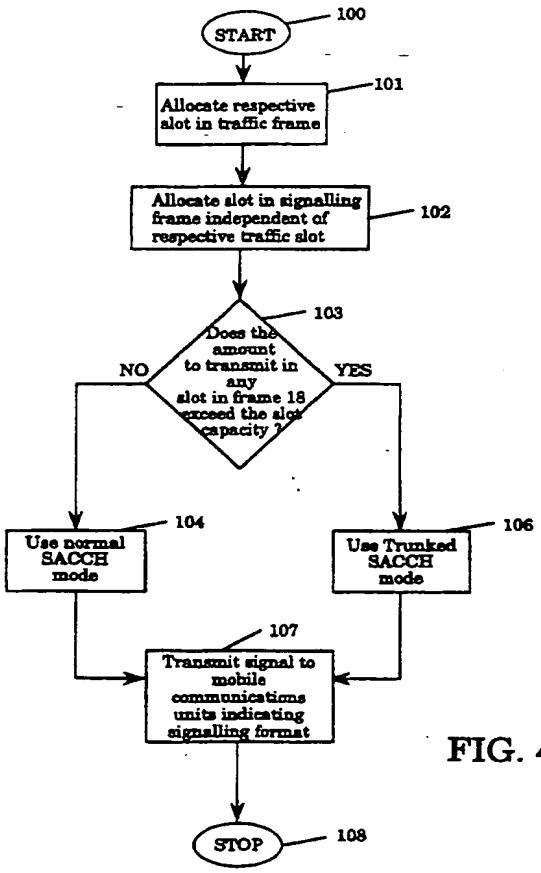

FIG. 4

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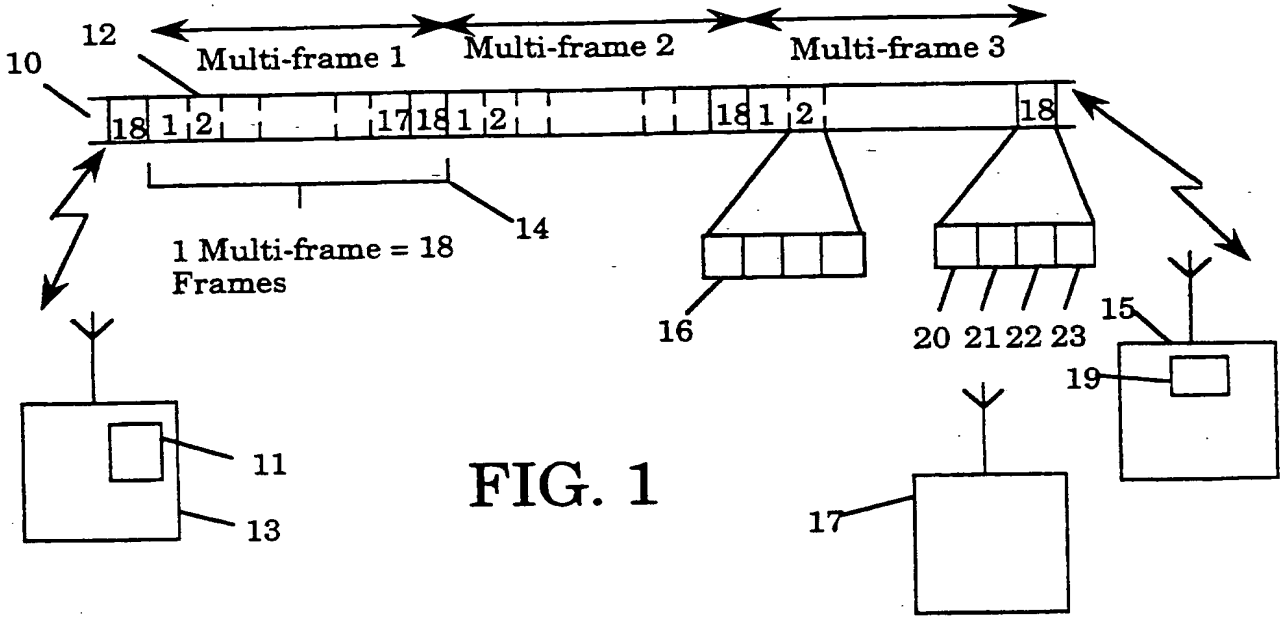

FIG. 1

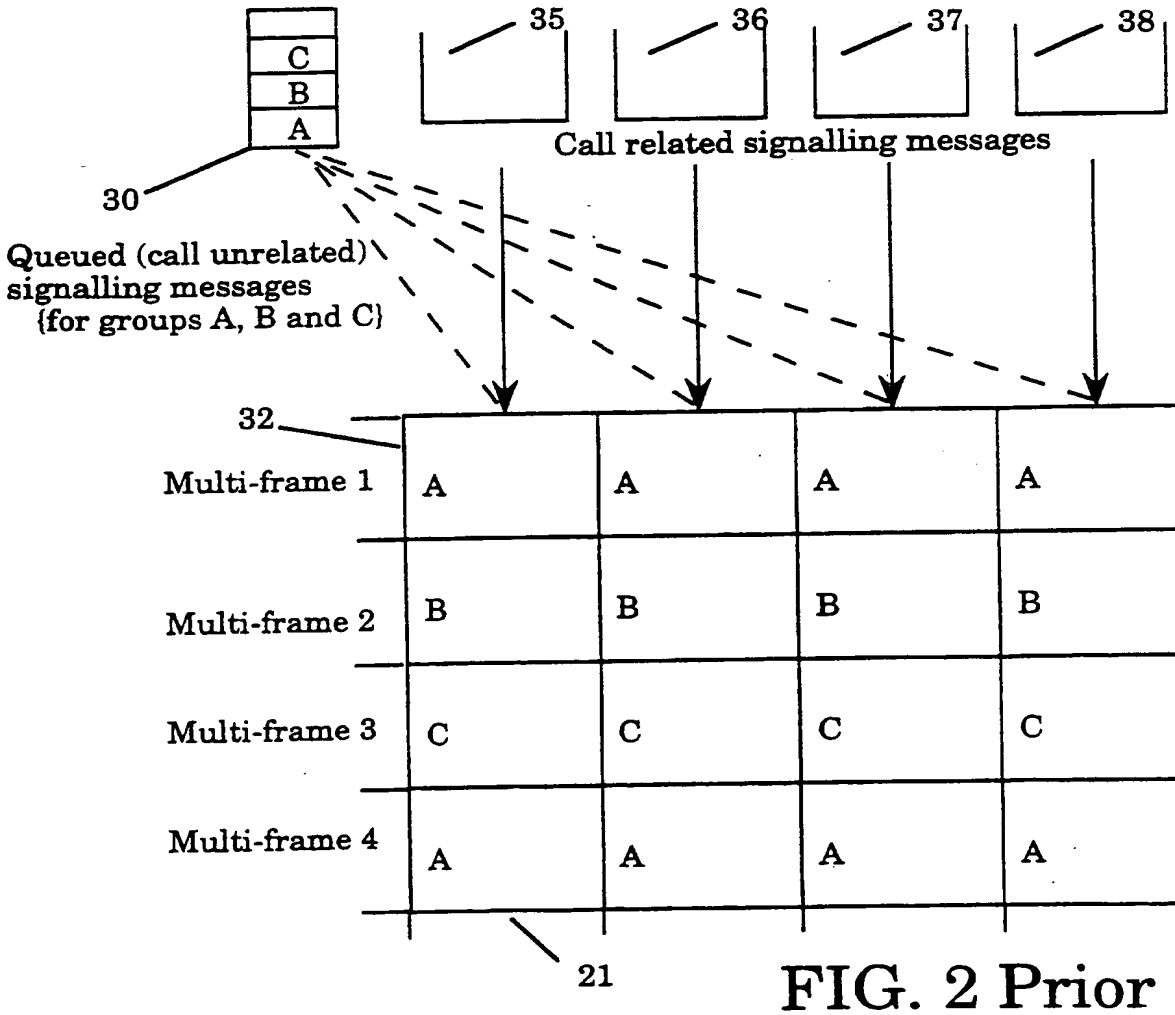

FIG. 2 Prior art

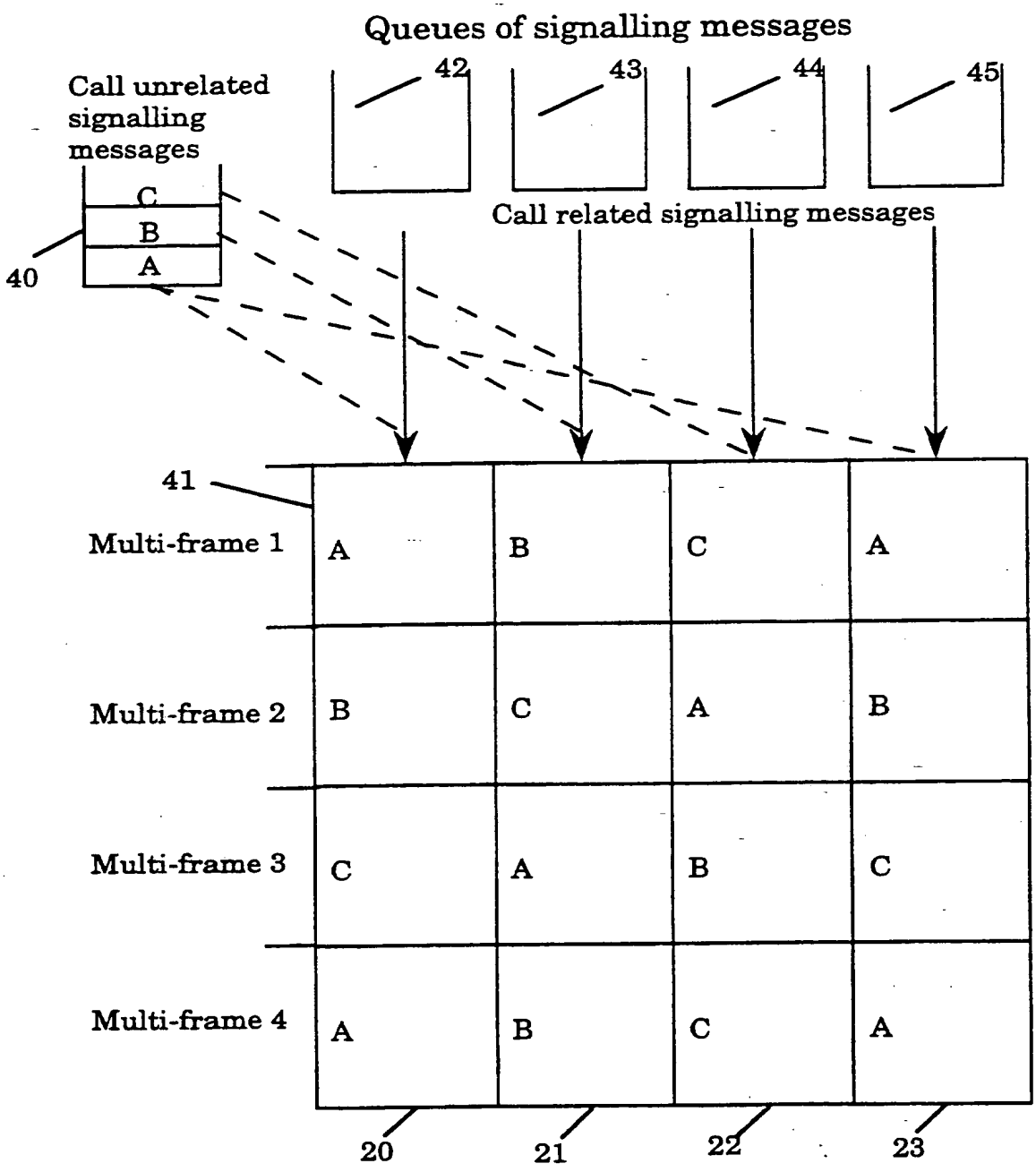
Queues of signalling messages
42
43
44
45
Call unrelated signalling messages
C
B
A
40
Call related signalling messages
41
Multi-frame 1
A
B
C
A
Multi-frame 2
B
C
A
B
Multi-frame 3
C
A
B
C
Multi-frame 4
A
B
C
A
20
21
22
23

FIG. 3

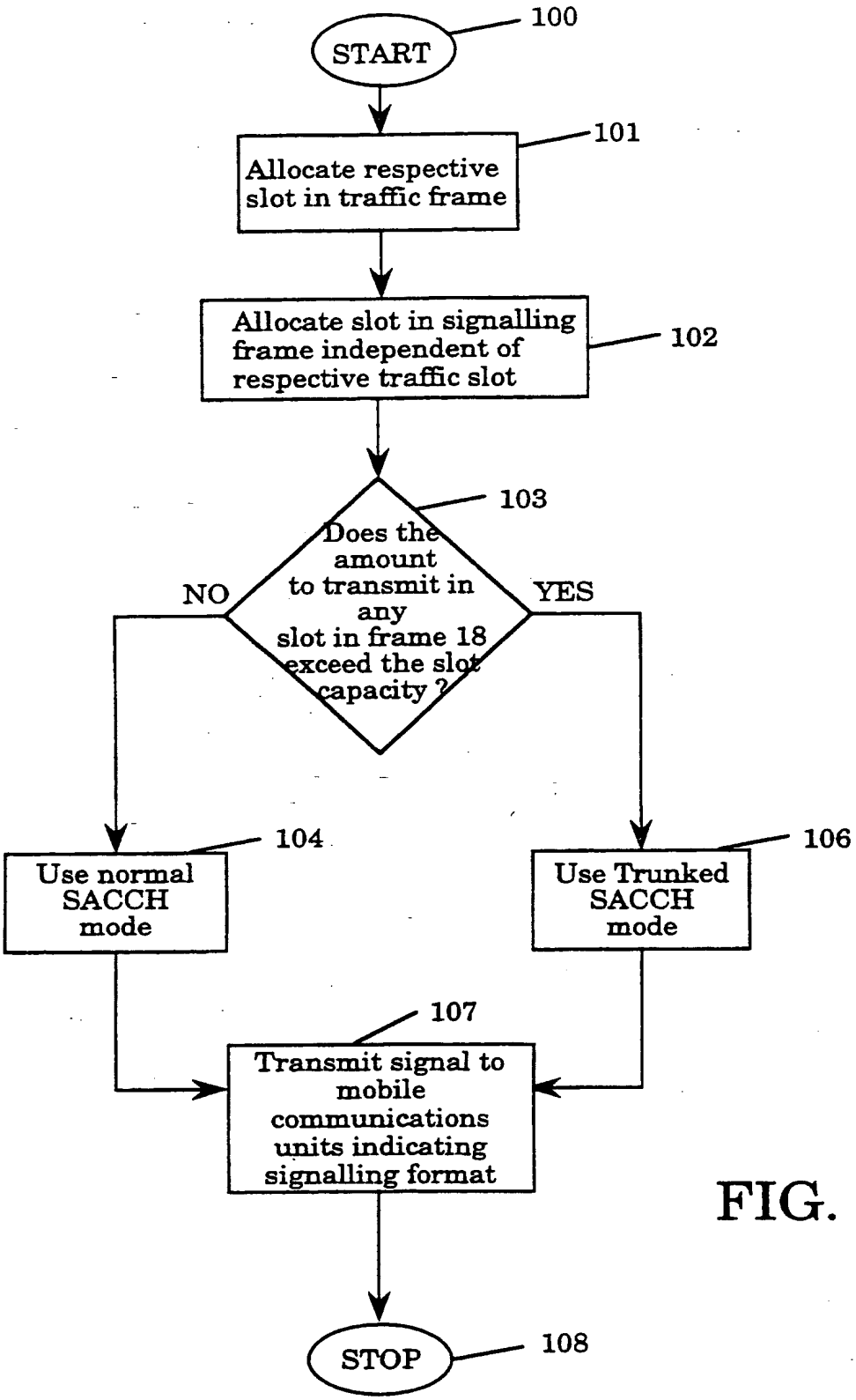
START
100
Allocate respective slot in traffic frame
101
Allocate slot in signalling frame independent of respective traffic slot
102
Does the amount to transmit in any slot in frame 18 exceed the slot capacity ?
103
NO
YES
Use normal SACCH mode
104
Use Trunked SACCH mode
106
Transmit signal to mobile communications units indicating signalling format
107
STOP
108

FIG. 4

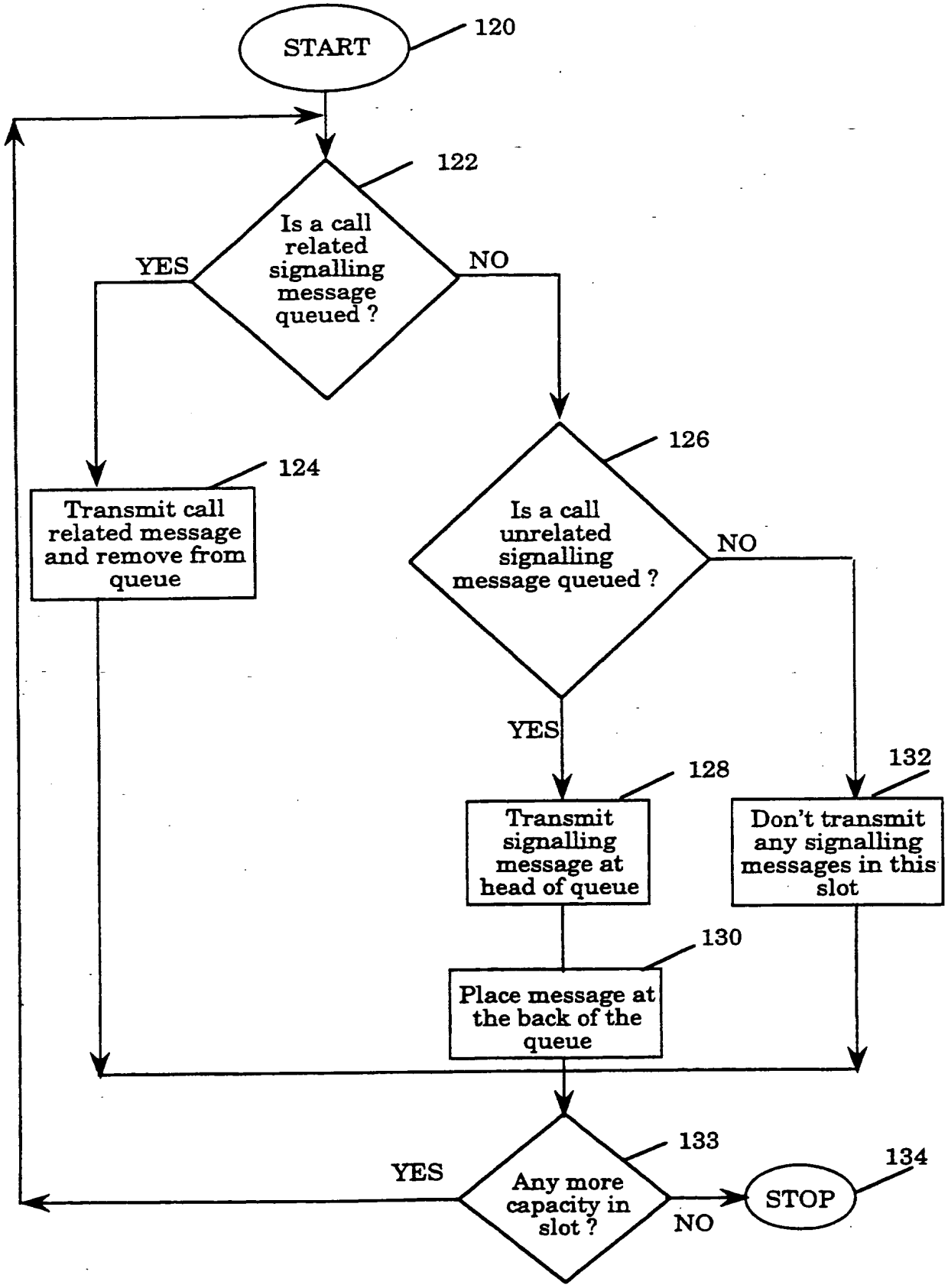
START
120
122
Is a call related signalling message queued ?
YES
NO
124
Transmit call related message and remove from queue
126
Is a call unrelated signalling message queued ?
NO
YES
128
Transmit signalling message at head of queue
132
Don't transmit any signalling messages in this slot
130
Place message at the back of the queue
133
Any more capacity in slot ?
YES
NO
134
STOP

FIG. 5

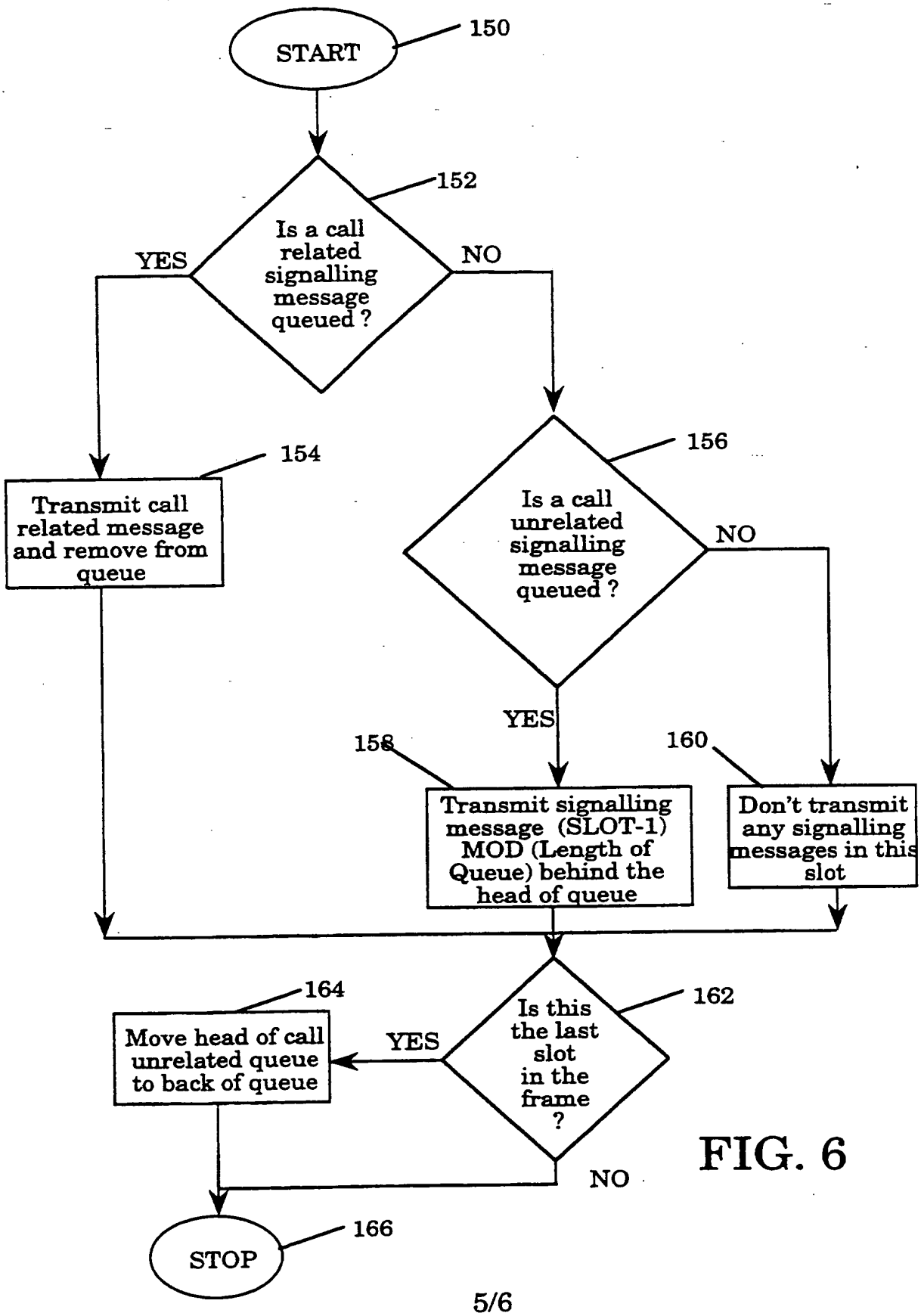
START
150
Is a call related signalling message queued ?
152
YES
NO
Transmit call related message and remove from queue
154
Is a call unrelated signalling message queued ?
156
NO
YES
158
Transmit signalling message (SLOT-1) MOD (Length of Queue) behind the head of queue
160
Don't transmit any signalling messages in this slot
Is this the last slot in the frame ?
162
YES
Move head of call unrelated queue to back of queue
164
NO
STOP
166

FIG. 6

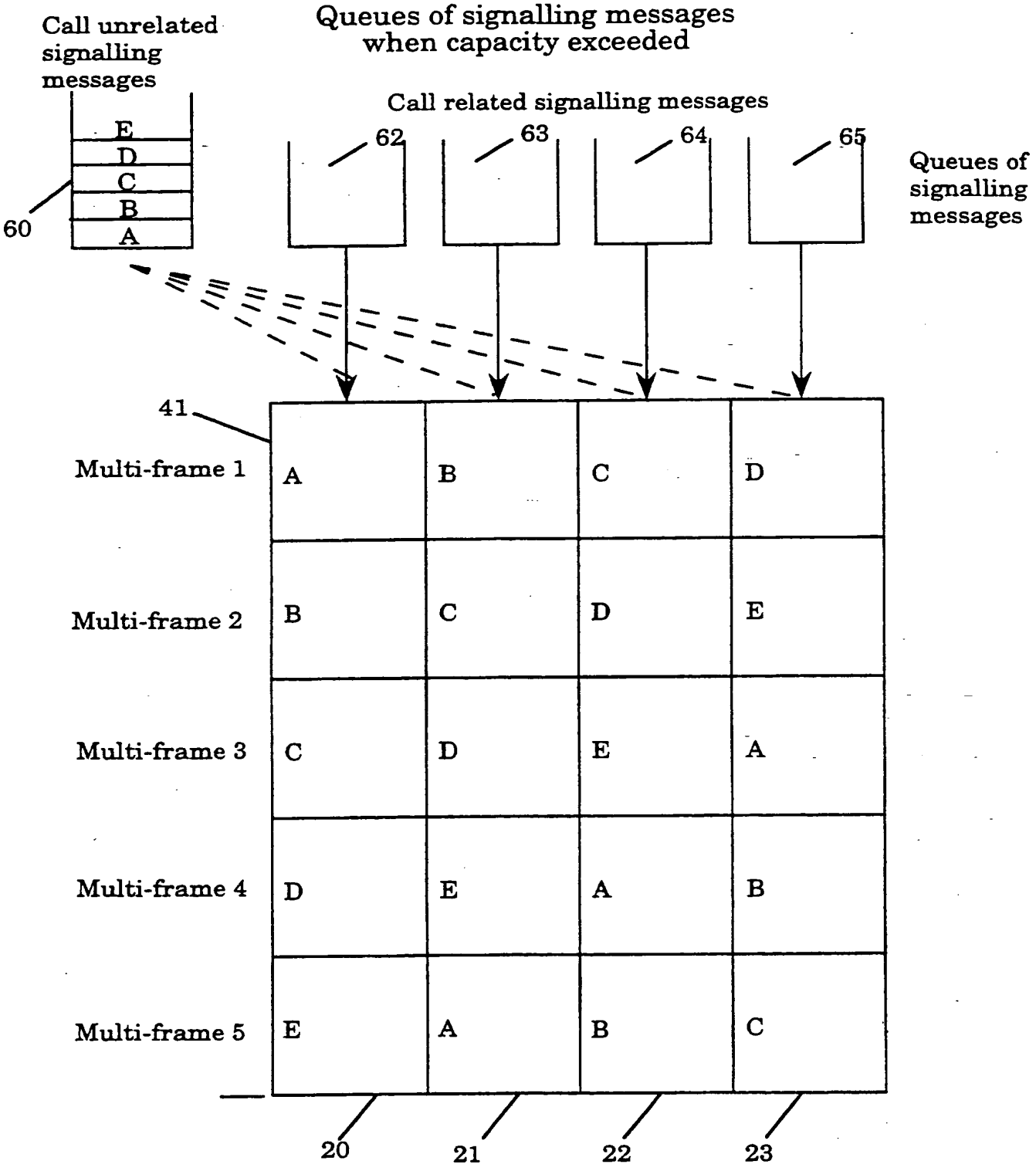
Call unrelated signalling messages
Queues of signalling messages when capacity exceeded
Call related signalling messages
E
D
C
B
A
60
62
63
64
65
Queues of signalling messages
41
Multi-frame 1
Multi-frame 2
Multi-frame 3
Multi-frame 4
Multi-frame 5
A B C D
B C D E
C D E A
D E A B
E A B C
20
21
22
23

FIG. 7

COMMUNICATIONS SYSTEM AND METHOD OF OPERATION

Field of the Invention

This invention relates to communications systems and, in particular, to time division multiplexed communications systems. The invention is applicable to, but not limited to, communications systems having traffic and signalling frames.

Background of the Invention

In many digital radio communications systems it is desirable to communicate traffic and signalling information between communications units. To provide both traffic and signalling operations, a communications system typically divides its communications resource into either independent frequency channels, as with a frequency division multiple access (FDMA) scheme, or independent time periods (frames), as with time division multiple access (TDMA) schemes.

The communications resource of a digital radio communications system is divided into time multi-frames, each time multi-frame being divided into a number of time frames and each time frame divided into a number of slots. A particular slot on all frames is allocated for a period of time for communications between users. Within a multi-frame the allocated slot is used either for traffic or signalling purposes.

In mobile radio systems such as the Trans European Trunked Radio (TETRA) system associated signalling, (e.g. short data service (SDS) messages, late entry signalling messages) is transmitted to subscriber units involved in calls, during the allocated signalling slot in the associated signalling frame. In TETRA, the associated signalling frame is allocated to frame eighteen of an eighteen frame TDMA structure and broadcast network information is sent on the broadcast network channel (BNCH) and broadcast synchronisation information is sent on the broadcast synchronisation channel (BSCH). Signalling messages transmitted on the associated signalling frame are transmitted as broadcast information, individually, group addressed. Sub-slots of the uplink signalling frame, i.e. signalling messages from a moblie radio unit to a base radio unit, are usually reserved for acknowledgements to individually addressed down-link signalling messages. However, any subscriber involved in a call may transmit or receive signalling messages in its allocated slot in the signalling frame (frame 18).

A problem occurs in a busy system whereby the associated signalling, to and from subscribers involved in a specific call, is too great to be sent or received on the one slot allocated for that call. In this situation, signalling messages, sent to and from subscribers involved in a call, are delayed by as much as a number of seconds until there is an opportunity for transmission. This is especially true when a priority monitor function is implemented in a system.

Thus, it is desirable to have an improved method for transmitting signalling information to communications units whilst the communications units are involved in a call. It would also be beneficial to have an improved traffic and signalling frame structure for a time division multiplexed communications system.

Summary of the Invention

In a first aspect of the present invention, a time division multiplexed communications system is provided. The communications system comprises time frames divided into traffic frames and signalling frames, and has a communications unit which is allocated a respective slot in a traffic frame, and is allocated a slot in a signalling frame independent of the respective slot allocated in the traffic frame.

Preferably the time division multiplexed communications system further comprises a system controller where the functional operation of the signalling frame is controlled by the system controller and is dependent upon the level of communication activity measured on the signalling frame.

In this manner, the allocation of signalling resource in the time division multiplexed communications system is controlled according to the needs of communications units and the level of communication activity on the signalling frame.

Preferably the signalling frame of the time division multiplexed communications system is arranged for operation in at least two modes. In a first mode of operation the slots of the signalling frame are assigned to those communications units to which corresponding slots of traffic frames are assigned. In a second mode of operation the slots of the signalling frame are assigned to those communications units independent of the corresponding slots of assigned traffic frames. One slot of the signalling frame is reserved for broadcast message services and at least one bit of the broadcast message slot signifies the operational mode of the signalling frame.

In this manner, the operation of the signalling frame can be alternated at least between a normal signalling mode and a trunked signalling mode where the signalling resource is signalling message priority or on demand. Advantageously, the communications units are informed of the functional operation of the signalling frame by an at least one-bit transmission on a broadcast message slot.

In a second aspect of the present invention, a method of operation of a time division multiplexed communications system is provided. The time division multiplexed communications system having a first communications unit communicating frame divided traffic and signalling information with a plurality of second communications unit. The method comprises the steps of allocating a respective slot in a traffic frame for transmissions from the first communications unit to a second communications unit. A slot in a signalling frame is allocated for signalling transmissions independent of the respective slot allocated in the traffic frame for transmissions from the first communications unit to a second communications unit.

In this manner, the signalling resource is allocated according to the signalling needs of the communications system and not to be consistent with the allocation of the traffic resource.

Preferably the signalling frame of the communications system is divided into slots and the functional operation of the signalling frame has at least two modes: a first mode of operation where the slots of the signalling frame are assigned to those second communications units to which corresponding slots of traffic frames are assigned, and in a second mode of operation the slots of the signalling frame are assigned to those second communications units independent of the corresponding slots of assigned traffic frames. The method further includes the steps of the first communications unit monitoring activity on the signalling frame of the time division multiplexed communications system and comparing the amount of activity on the signalling frame with the capacity of the signalling frame. The first communications unit adapts the functional operation of the signalling frame to operate in the second mode of operation when the communications activity exceeds the capacity of the signalling frame.

Preferably the first communications unit transmits independent signalling messages in subsequent slots of the signalling frame when the communications activity exceeds the capacity of a single slot in the signalling frame. The first communications unit transmits a first signal on a respective signalling slot, i.e. a broadcast message slot, to each of the second

communications units indicating the functional operation of the signalling frame. Second communications units scan a number of slots in the signalling frame to receive signalling information relevant to that particular second communications unit.

In this manner, the functional operation of the signalling resource is optimised according to the signalling needs of the time division communications system. Advantageously, when the signalling requirements exceed the signalling capacity of the communications system, trunking of the signalling channel is used.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the drawings.

Brief Description of the Drawings

FIG. 1 illustrates a general time division multiplexed communications system.

FIG. 2 is a diagram showing a prior art process of transmitting signalling messages.

FIG. 3 is a diagram showing a signalling frame structure, according to a preferred embodiment of the invention.

FIG. 4 is a flowchart showing options of signalling transmissions in the communications system in accordance with the preferred embodiment of the invention.

FIG. 5 is a flowchart showing the signalling operation of the communications system in accordance with the preferred embodiment of the invention.

FIG. 6 is a flowchart showing a preferred feature of the signalling operation of the communications system in accordance with the preferred embodiment of the invention.

FIG. 7 is a diagram showing a signalling frame structure in accordance with a preferred embodiment of the invention.

Detailed Description of the Drawings

Referring first to FIG. 1, a general time division multiplexed communications system, is shown. The communications system comprises a first communications unit 13 communicating frame divided communications 10 with second communications units 15 and 17. The first communications

unit has a system controller 11 and one second communications unit 15 has a scanning element 19. The frame divided communications 10 comprises a number of multi-frames 14 divided into eighteen time frames 12, seventeen of which are reserved for traffic communications and the eighteenth frame is reserved for signalling communications. Each traffic and signalling time frame is divided into four time slots 16, with the signalling frame being used for associated signalling for mobiles involved in calls. The associated signalling may be either call related, i.e. specific to a call, or call unrelated (not specific to a call but broadcast to all mobiles involved in calls). An example of a call related message is a short data message directed to one or more mobiles known to be involved in a call. An example of a call unrelated message is notification of an active group call on another traffic channel.

In operation a second communications unit 15 is allocated a respective time slot 16 in a traffic frame, and allocated signalling slots 20, 21, 22 and/or 23, in the signalling frame independent of the respective slot allocated in the traffic frame. Advantageously, the signalling frame resource is allocated according to the needs of the communications units communicating on the time division multiplexed communications system.

Referring now to FIG. 2, a diagram of a prior art process of transmitting signalling messages, is shown. The diagram shows a four slot signalling frame, for each of the first four multi-frames. Call related signalling messages are stored in call related signalling queues (CRSQs) 35 to 38 and transmitted in the signalling frame in the appropriate signalling slots, e.g. call related signalling messages from CSRQ 35 are transmitted to the communications unit allocated the first slot 21 in the signalling frame. When no signalling messages are held within the CRSQ 35, 36, 37 and/or 38, call unrelated signalling messages are transmitted as shown, from the call unrelated signalling queue (CURSQ) 30.

In operation, a second communications unit, e.g. a mobile, transmits and receives speech on its allocated slot in frames one to seventeen of the traffic time frames. In addition, the mobile monitors its allocated slot for associated signalling in the eighteenth frame. Hence, all call unrelated messages need to be transmitted in every slot in the signalling frame to ensure that all mobiles involved in calls receive the message. In this manner, all subscriber units listen to their particular slots in order to receive each message, i.e. a subscriber unit allocated to slot one receives signalling message 'A' in multi-frame one, signalling message 'B' in multi-frame two and so on. This approach to associated signalling is wasteful of the

bandwidth available as the same information is transmitted in every slot of the frame and increases the time delay for mobiles receiving the call unrelated messages.

Referring now to FIG. 3, a diagram of a signalling frame structure, according to a preferred embodiment of the invention, is shown. Signalling messages on the signalling frame involve either call related messages from a queue of call related messages 42 to 45 or call unrelated messages from a queue of call unrelated messages 40. The signalling frame occurs on the eighteenth frame of the first multi-frame 41 and on every eighteenth frame of each multi-frame thereafter. The first multi-frame 41 comprises four time slots 20, 21, 22 and 23.

In operation, mobiles involved in calls on the traffic channel are informed via a flag (at least one bit and preferably two bits) on the broadcast control channel (BCCH), either the BNCH or the BSCH, that they should listen to all four slots of the signalling frame. This configures the eighteenth frame as a trunked slow associated control channel (TSACCH). Call unrelated messages are now considered to be broadcast to all radios involved in calls on that carrier frequency, once the message has been transmitted on any of the four slots of the signalling frame. All call unrelated messages to be transmitted on the signalling frame are placed in the call unrelated signalling queue (CURSQ) 40. Call related signalling messages are placed in the call related signalling queues (CRSQ) 42 to 45 for the allocated slot for that call. When there are no pending call related signalling messages at the head of the CRSQ 42 on a specific slot within the signalling frame, i.e. the first time slot 20 of the first multi-frame 41, the message 'A' at the head of the CURSQ 40 is transmitted and the transmitted signalling message 'A' is sent to the back of the CURSQ 40. At the next slot 21 within the signalling frame, where there are no signalling messages in the CRSQ 43 of that slot 21, the same procedure is followed, i.e. the signalling message 'B' at the head of the CURSQ 40 is transmitted and the transmitted signalling message 'B' is sent to the back of the CURSQ 40. Consequently, call unrelated signalling messages are cycled faster. Advantageously, different information is transmitted in every slot making more efficient use of the information bandwidth and hence, the time to receive call unrelated message is reduced.

In a preferred embodiment of the present invention the time division multiplexed communications system includes a system controller 11 to control the functional operation of the signalling frame dependent upon the level of communication activity measured on the signalling frame. The

signalling frame is arranged for operation in at least two modes. In a first (standard) mode of operation the slots of the signalling frame are assigned to those communications units to which corresponding slots of traffic frames are assigned, as described with regard to FIG. 2. In a second (TSACCH) mode of operation the slots of the signalling frame are assigned to those communications units independent of the corresponding slots of assigned traffic frames, as described with regard to FIG. 3. In the preferred embodiment, at least one slot or sub-slot of the signalling frame is reserved for broadcast message services and at least one bit of the broadcast message slot signifies the operational mode of the signalling frame.

Referring now to FIG. 4, a flowchart shows the method of allocating independent signalling frames and the decision process in choosing a signalling option in the communications system in accordance with the preferred embodiment of the invention. The method shows the signalling options of a time division multiplexed communications system having a first communications unit communicating frame divided traffic and signalling information with a plurality of second communications units. The method includes the steps of allocating a respective slot in a traffic frame, as in step 101, for transmissions from the first communications unit to a second communications unit. Advantageously, a slot is allocated in a signalling frame independent of the respective slot allocated in the traffic frame, as shown in step 102, for signalling transmissions from the first communications unit to the second communications unit. Such a method effectively trunks the operation of the signalling frame, i.e. the signalling frame enters a trunked SACCH mode.

The process of FIG. 4 starts, in step 100, with the allocation to a communications unit of a respective slot in the traffic frame, as in step 101. At least one slot is allocated to the communications unit in the signalling frame, independent of the respective slot allocated in the traffic frame, as shown in step 102. The amount of communications activity on any signalling slot within the signalling frame is monitored and compared to the slot capacity, as in step 103. If the amount of signalling messages to be transmitted exceeds the capacity of the particular slot, as in step 103, a trunked slow associated control channel (TSACCH) mode of operation is employed, as shown in step 106. If the amount of signalling messages to be transmitted does not exceed the capacity of the particular slot in step 103, a normal slow associated control channel (SACCH) mode of operation is employed, as shown in step 104. Whichever mode of operation of the

signalling frame is allocated, the mobile communications units are informed by the transmission of a first signal, as shown in step 107, before the allocation and decision process is complete, as in step 108.

Advantageously, the TSACCH mode of operation is only employed when the signalling capacity of any particular slot of the signalling frame in the communications system is exceeded.

The method described in FIG. 4 applies to a signalling frame of a communications system which is divided into slots and where the functional operation of the signalling frame has at least two modes. In a first mode of operation the slots of the signalling frame are assigned to those second communications units to which corresponding slots of traffic frames are assigned. In a second mode of operation the slots of the signalling frame are assigned to those second communications units independent of the corresponding slots of assigned traffic frames. The method includes the first communications unit monitoring activity on the signalling frame of the time division multiplexed communications system and comparing the amount of activity on the signalling frame with the capacity of the signalling frame. The functional operation of the signalling frame is then operated in its second mode of operation when the communications activity exceeds the capacity of a slot within the signalling frame. The first communications unit transmits independent signalling messages in subsequent slots of the signalling frame and transmits a first signal on a respective signalling slot to each of the second communications units. The first signal indicates the functional operation of the signalling frame and the respective signalling slot is a broadcast message slot.

Advantageously, a second communications unit, capable of scanning a number of slots in the signalling frame, receives relevant signalling information faster than those second communications units unable to scan the whole of the signalling frame.

Referring now to FIG. 5, a flowchart of the timing of communications within the communications system, in accordance with a preferred embodiment of the invention, is shown. The process starts in step 120 and the status of the call related signalling queue (CRSQ) monitored, as in step 122. If a message exists in the CRSQ of step 122, the call related message is transmitted, as shown in step 124. If there is any more capacity in the slot, as in step 133, e.g. if a sub-slot structure is used, the process returns to step 122. If there is no more capacity for that particular slot the process stops, as shown in step 134. If a message does not exist in the CRSQ of step 120, the

status of the call unrelated signalling queue (CURSQ) is monitored, as in step 126. If a message exists in the CURSQ of step 126, the call unrelated message is transmitted, as shown in step 128, the call unrelated message is placed at the back of the CURSQ, as shown in step 130. If there is any more capacity in the slot, as in step 133, e.g. if a sub-slot structure is used, the process returns to step 122. If there is no more capacity for that particular slot the process stops, as shown in step 134. If a message does not exist in the CURSQ of step 126, no signalling message is transmitted for that particular slot, as shown in step 132.

Referring now to FIG. 6, a flowchart of a preferred feature of the signalling operation of the communications system in accordance with the preferred embodiment of the invention, is shown. The process starts in step 150 and the status of the call related signalling queue (CRSQ) monitored, as in step 152. If a message exists in the CRSQ of step 152, the call related message is transmitted, as shown in step 154, and the process checks whether the slot is the last in the frame, as shown in step 162. If a message does not exist in the CRSQ of step 150, the status of the call unrelated signalling queue (CURSQ) is monitored, as in step 156. If a message exists in the CURSQ of step 156, an algorithm is used to point to the next signalling message for transmission from the CURSQ, as shown in step 158. The algorithm is defined as:

1+(SLOT-1) modulus (length of queue).

The algorithm rotates the signalling messages for transmission, as shown in more detail in FIG. 7. The term "SLOT" defines the current slot number for which the transmission is being prepared. The process then checks whether the slot is the last in the frame, as shown in step 162. If a message does not exist in the CURSQ of step 156, no signalling message is transmitted for that particular slot, as shown in step 160 and the process also moves to step 162. If the particular slot is the last one in the signalling frame, as in step 162, the head of the CURSQ is placed at the back of the queue, as shown in step 164, and the process stops, as in step 166, until the next signalling frame occurs. If the particular slot is not the last one in the signalling frame, as in step 162, the process stops for that particular slot, as shown in step 166.

Advantageously, the method of FIG. 6 supports mobiles which are not capable of scanning the whole of the signalling frame. All channels will eventually see all of the call unrelated messages, but there is a distinct

advantage for mobiles scanning the whole of the signalling frame in that they will see all messages earlier. This process is further demonstrated in FIG. 7.

FIG. 7 is a diagram showing a signalling frame structure in accordance with a preferred embodiment of the invention, as detailed in FIG. 6. This method is particularly applicable when call unrelated signalling messages exceed the signalling capacity. Signalling messages on the signalling frame involve either call related messages from a queue of call related messages 62 to 65 or call unrelated messages from a queue of call unrelated messages 60. The signalling frame occurs on the eighteenth frame of the first multi-frame 14 and on every eighteenth frame of each multi-frame thereafter. The multi-frame 41 comprises four signalling time slots 20, 21, 22 and 23.

In operation, mobiles involved in calls on the traffic channel are informed via a flag on the BCCH (either the BNCH or the BSCH) that they should listen to all of the signalling frame. This configures the eighteenth frame as a trunked slow associated control channel (TSACCH). Call unrelated messages are now considered to be broadcast to all radios involved in calls on that carrier frequency. All call unrelated messages to be transmitted on the signalling frame are placed in the call unrelated signalling queue (CURSQ) 60. Call related signalling messages are placed in the call related signalling queues (CRSQ) 62 to 65 for the particular slot for that call. When there are no pending call related signalling messages at the head of the CRSQ on a specific slot within the signalling frame, i.e. the first time slot 20 of the eighteenth frame of the first multi-frame 41 with associated CRSQ 62, the signalling message 'A' at the head of the CURSQ 60 is transmitted. At the next slot 21 within the signalling frame, where there are no signalling messages in the CRSQ 63 of that slot 21, the next message in the CURSQ 60 is transmitted, i.e. the signalling message 'B' at the head of the CURSQ 60 is transmitted. This process continues until the last signalling slot has been used, at which point the head of the CURSQ 60, i.e. signalling message 'A' in FIG. 7, is placed at the back of the CURSQ 60.

Consequently, all channels will eventually see all of the call unrelated messages, but there is a distinct advantage for mobiles scanning all of the signalling frame, in that they will receive all signalling messages earlier than mobiles who can not scan all of the signalling frame.

In a preferred feature of the present invention call related signals from the CRSQ of another slot are transmitted. The decision on whether to transmit call related signals of another slot is dependent on the priority basis

or on a queue loading basis, i.e. monitoring the status of the queues. A further enhancement is gained by placing all of the signalling messages in a single prioritised queue and scheduling them for transmissions accordingly. Such enhancements rely on all mobiles being able to scan all of the signalling frame.

It is within the contemplation of the invention that the signalling format, described above with regard to downlink communications between the system and mobile communications units, is equally applicable for uplink communications from mobile communications units to the system. Time frames, slots and sub-slots are described in a relative manner.

The preferred embodiment of the invention has been described with regard to a single-site communications system. It is considered that the all of the aspects to the preferred embodiment are equally applicable in a multi-site communications system, wherein a higher level of signalling control is used. In such a multi-site system, the allocation of signalling resource throughout the communications sites, is primarily dependent upon the priority of the signalling messages to be transmitted throughout the multi-site system or within the individual single-site communications systems.

A TDM communications system has thus been described which provides frame divided communications and in which a given slot of each traffic frame is allocated to a given channel or subscriber unit and in which a signalling frame is provided. The signalling frame is divided into slots and the slots of the signalling frame are selectively used by channels or subscriber units other than the channels or subscriber units to which corresponding traffic slots are allocated. The slots of the signalling frame selected for use are either allocated by the system controller or selected by the subscriber unit.

Thus, an improved method for transmission of signalling information whilst communications units are involved in a call is provided. A timing structure for a time division multiplexed communications system offering enhanced traffic and signalling communications is also given.

Claims

1. A time division multiplexed communications system comprising time frames divided into traffic frames and signalling frames, wherein a communications unit is allocated a respective slot in a traffic frame, and is allocated a slot in a signalling frame independent of the respective slot allocated in the traffic frame.

2. The time division multiplexed communications system of claim 1 further comprising a system controller wherein functional operation of a signalling frame is controlled by the system controller and is dependent upon the level of communication activity measured on the signalling frame.

3. The time division multiplexed communications system of claim 2 wherein a signalling frame is arranged for operation in at least two modes and wherein in a first mode of operation slots of the signalling frame are assigned to those communications units to which corresponding slots of traffic frames are assigned, and in a second mode of operation the slots of the signalling frame are assigned to those communications units independent of corresponding slots of assigned traffic frames.

4. The time division multiplexed communications system of claims 2 and 3 wherein one slot of a signalling frame is reserved for broadcast message services and wherein at least one bit of a broadcast message slot signifies an operational mode of the signalling frame.

5. The time division multiplexed communications system of any of the preceding claims wherein the communications system is a Trans European Trunked Radio system, a signalling frame is an eighteenth frame of the Trans European Trunked Radio timing format and broadcast messages are transmitted on a broadcast service channel (BSCH) and a broadcast network channel (BNCH).

6. A method of operation of a time division multiplexed communications system having a first communications unit communicating frame divided traffic and signalling information with a plurality of second communications unit, the method comprising the steps of:

allocating a respective slot in a traffic frame for transmissions from the first communications unit to a second communications unit, and

allocating a slot in a signalling frame independent of the respective slot allocated in the traffic frame for transmissions from the first communications unit to a second communications unit.

7. The method according to claim 6 wherein a signalling frame of a communications system is divided into slots and functional operation of the signalling frame has at least two modes, wherein in a first mode of operation slots of the signalling frame are assigned to those second communications units to which corresponding slots of traffic frames are assigned, and in a second mode of operation slots of the signalling frame are assigned to those second communications units independent of corresponding slots of assigned traffic frames, the method further comprising the steps of:

monitoring signalling activity on the time division multiplexed communications system, by a first communications unit,

comparing a level of signalling activity with a signalling slot capacity, and

adapting signalling format to the second mode of operation when signalling activity exceeds the signalling slot capacity.

8. The method according to claim 6 and 7, further including the step of transmitting independent signalling messages in subsequent slots of a signalling frame by a first communications unit.

9. The method according to claims 6 to 8, further comprising the step of transmitting a first signal on a respective signalling slot from a first communications unit to each second communications unit wherein the first signal is indicative of a signalling mode of operation and the respective signalling slot is a broadcast message slot.

10. The method according to claims 6 to 9, further comprising the step of a second communications unit scanning a number of slots in a signalling frame

in order to receive signalling information relevant to the second communications unit.

11. The method according to claims 6 to 10 wherein a single queue of signalling messages is transmitted on the downlink trunked slow associated control channel of the communications system according to the individual priority of signalling messages.

The Patent Office

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: ONLINE: WPI, INSPEC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	US5199031A	(Dahlin) Whole document, especially lines 23-28 of column 2.	1, 6.
A	US4178479A	(McDonald) Whole document.	1, 6.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.